REMARKS

Claims 1-17 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.

Claims 1-4, 6, 10, 12 and 13 -17 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Hansen et al (US 5,589,256).

Claims 1, 5-11 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Hansen et al (US 5,589,256) as applied to Claims 1-4, 12 and 13 and further in view of Hansen et al (US 5,789,326).

Examiner's Interview

Applicant's Agent is appreciative of the interview on November 15, 2006.

Amendment to Claim 1 citing that curing takes place at a temperature from about 160 °C to about 215 °C was discussed. Applicant's Agent cited, and gave the Examiner a copy of *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA1976) as well as a copy of Section MPEP 2163.05 III. The original specification described a range of a range of 25 to 60 % solids and specific embodiments of 36 % and 50 %. The limitation of 35 % to 60 % was held to be supported. Applicant's Agent argued the ruling supported the amendment. No agreement was reached on this issue.

Applicant's Agent discussed the 103 (a) rejection and aspects of the 132 Affidavit. Differences between the functionality of binders and crosslinking agents were pointed out and that some polyols such as sorbitol and xylitol indeed do not crosslink as shown in the Stoyanov Declaration. Applicant agreed to clarify differences between binders and crosslinking agents. It was Applicants position that the '256 reference only teaches the use of a polycarboxylic acid and a polyol as a binder and not the combination as crosslinking agents. No agreement was reached on this issue.

Response to Examiner's Statements In Interview Summary

Applicants respectfully disagree with the Examiner's reason for not accepting the limitation of "160°C to 215°C" in Claim 1. As noted above, in *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA1976) a range of 25 to 60% solids was disclosed in the specification as well as specific embodiments of 36% and 60%. The limitation of 35% to 60% solids was held to be supported. The Examiner state that this "35% to 60% limitation was acceptable "because it is close to the specific example of 36%". Applicants request the Examiner to specifically point out where in MPEP 2316.05 III or in the case itself that this is the reason. It is submitted that the Examiner has done nothing more than to argue lack of literal support which is not enough. If lack of literal support were enough to support a rejection under 112 then the statement of *In re Lukach*, 442 F.2d at 969, 58 CCPA at 1235, 169 USPQ at 796, that "the invention claimed does not have to be described in ipsis verbis in order to satisfy the description requirement of 112. Applicants submit that one skilled in the art would recognize the narrower limitation of 160°C to 215°C is part of the overall range (120°C to 215°C) in which the invention operates and have disclosed specific temperature values for carrying out the claimed method. Withdrawal of the rejection under 112 is respectfully requested.

Relative to the rejection of the claims, the Examiner states that Hansen et al. in the '256 patent discloses, in column 19, line 61, the binders may be a combination of polycarboxylic acid and a polyol and states in column 23, line 7-9, specific binders that can also crosslink include polyols, polycarboxylic acids and polyamines. Applicant does not dispute the fact that *binders* (emphasis added) either individually or in combination may be a a polycarboxylic acid or a polyol. In fact, the '256 patent shows in the figure in column 16 lines 30 – 35 the *binding through hydrogen bonds* of a carboxylic acid with an alcohol (R^1 could conceivably be a hydroxyl group from cellulose). The binding of a polyol is shown in column 14, line 20 - 30, again, *through hydrogen bonds*. Applicants submit than in the particular reference in column 23, line 7-9, there is no suggestion that a combination of the polycarboxylic acid and the polyol is used in *crosslinking* cellulose fibers to achieve the Whiteness Index in the instant invention rather, the reference teaches that polyols, polycarboxylic acids and polyamines i.e. individually, independently, or alone, can crosslink. The Examiner has taken the position that because Hansen et al. state

that the combination of a polyol and a polycarboxylic acid can be used as binders then the reference in column 23, line 7-9 which states that specific binders that can crosslink are polyols, polycarboxylic acids and polyamines means that the combination can also be used to crosslink and achieve the fiber color properties of the instant invention. Applicants submit this is incorrect. If this position is taken then one must also take the position that, for example, polyols and polycarboxylic acids each can crosslink and give the color increase shown by the combination. As shown in the Stoyanov Declaration, specifically, the acyclic subgenus of polyols and the species sorbitol and xylitol, Samples H, I and J, K, respectively show that these polyols do not crosslink as shown by the low bulk values (10.76 -11.43 cc/g) vs. citric acid, a polycarboxylic acid with a value of 18.48 g/cc and do not show a color increase. Likewise, citric acid while showing an increase in bulk, has an adverse effect on the Whiteness Index. Thus the results are new and unexpected since one would not expect crosslinking with a crosslinking agent which has an adverse effect on the Whiteness Index could be used to crosslink cellulose in the presence of a polyol which has no effect on the Whiteness Index to achieve Whiteness Indexvalues of the instant invention. Withdrawal of the rejection under 103 (a) is respectfully requested.

The Rejection Under 35 U.S.C. § 112

This rejection has been addressed under the Response to Examiners Statements In Interview Summary, paragraph one, above. Withdrawal of the rejection is respectfully requested.

The Rejection of Claims 1-4 and 12 -14 Under 35 U.S.C. § 103 (a)

Claims 1- 4, 6, 10, 12-17 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Hansen et al., US 5,589,256, (the '256 patent). (Office Action of July 28, 2005). Withdrawal of the rejection is respectfully requested for the following reasons.

Arguments cited in the Response to Examiners Statements in the Interview Summary are incorporated herein as a basis for requesting a withdrawal of the rejection.

Applicants submit that there is no motivation, suggestion or teaching in the '256 reference to arrive at the instant invention as claimed.

The Hansen et al. invention concerns polymeric and non-polymeric binders for fibers and the use of such binders in binding particles to fibers. In particular embodiments the invention concerns binding superabsorbent particles to cellulosic fibers which may then be used, for example, to make absorbent fibers that are densified and incorporated into cellulosic products, column 1, lines 6-14.

Binders form coordinate covalent bonds or hydrogen bonds. The *binding through hydrogen bonds* of a carboxylic acid with an alcohol (R^1 could conceivably be a hydroxyl group from cellulose) is shown in the figure in column 16 lines 30-35. The binding of a polyol, *through hydrogen bonds* is shown in column 24, line 20 – 30. On the other hand polycarboxylic acid crosslinking agents can react with, for example cellulose to form a covalent bond with cellulose. When this occurs, the crosslinking agent which may have been able to act as a binder also no longer has any binding capability.

In column 19, lines 50 – 56, and line 61, Hansen discloses that non-polymeric binders may be selected *independently* or in *combination* from the group consisting of an amino alcohol, a polycarboxylic acid, a polyol, a hydroxy acid, an amino acid, an amide and a polyamine and indicates, among others, that a polycarboxylic acid and a polyol is one of a preferred group *[of nineteen (19) generic binders]* for binding purposes. In this context, Hansen does not state that the combination can be used in *crosslinking cellulose* rather, a polycarboxylic acid and a polyol is one of a preferred group of nineteen (19) *binders*. If, as Hansen states, the *binders* can be selected *independently* or *in combination* and *if* the binders were indeed all crosslinking agents, then a polyol such as sorbitol would show an increase in wet bulk and perhaps an increase in the Whiteness Index in the experiments in the Stoyanov Declaration which was submitted in the response dated August 21, 2006. The declaration, however, categorically proves that acyclic polyols such as sorbitol and xylitol do not crosslink as evidenced by the low bulk values and neither do they result in an increase the Whiteness Index. The fact that Hansen et al. discloses that the *binders* can be a combination of a polycarboxylic acid and a polyol column 19, lines 50 -56 and line 61, does not mean that any polycarboxylic acid or any polyol, if used independently, or in combination of the polyol and polycarboxylic acid in a crosslinking reaction with cellulose will yield the fiber Whiteness Index properties in the instant invention. In this context the reference only refers to the combination of a

polyol and a polycarboxylic acid as being *binders*, not crosslinking agents and one must take the reference in the context of the discussion on *binders*, not crosslinking agents. In fact there is no motivation to try the combination since when polyols such as sorbitol and xylitol are used independently, as in the Stoyanov declaration, there is no increase in bulk but more importantly, there is no positive change in Whiteness Index (Samples H, I, sorbitol and Samples J and K, xylitol). Also, when a crosslinking agent such as citric acid (which Hansen et al. also cite as a binder) is used *independently* in preparing high bulk fibers, the bulk increases but the Whiteness Index decreases significantly as shown in the Stoyanov declaration, Sample C, where the Whiteness Index decreased to 68.69 from the control, Sample B of 77.87. Thus the skilled artisan would not look to combining a polyol which has no effect on the Whiteness Index with a polycarboxylic acid which has an adverse effect on the Whiteness Index to improve the color of crosslinked fibers since when used independently they teach away from the instant invention. Thus the increase in Whiteness Index, as shown in the Stoyanov Declaration when a polyol such as sorbitol at a level of 2 to 6 % by weight cellulose and a crosslinking agent such as citric acid are combined in the crosslinking reaction gives unexpected results. Furthermore, Hansen et al. does not disclose which species of polycarboxylic acids in combination with which species of polyols will yield the cited Whiteness Index properties in the instant invention. Thus it would not be obvious to one skilled in the art to try the crosslinking of cellulose in the presence of a polyol to arrive at the instant invention. Applicants submit that on this basis the prior art does not teach the identical chemical structure and therefore the fiber Whiteness Index properties the Applicants disclose are not present.

In the context of forming high bulk fiber with intrafiber covalent crosslinks, column 37, line 16 – column 42, line 63, Hansen et al. state that crosslinking agents can be added to the mat of cellulose fibers. Various urea derivatives are disclosed with DMDHEU being a preferred substance. Polycarboxylic acids such as citric acid is also identified as a crosslinking agent, column 38, lines 15-36. Hansen et al. state that particle binders and particles can be added before, after, or simultaneously with curing, column 42, lines 32 and 33. Curing in the presence of a binder is not usually a problem because the binder cannot participate in the intra fiber crosslinking reaction and the binder is not affected by the curing step. In certain situations, however, the

binder can function as a crosslinking agent and form covalent intrafiber crosslinks. This must be read in the context of Example XXVl, column 41, line 24-33 where it is stated that *dimethyloldihydroxyethylene urea* is used as a crosslinking agent. Later, in the same context, Hansen et al. the state that *polycarboxylic acids (such as citric acid), polyols (such as propylene glycol) and polyamines (such as ethylene diamine)* can function as crosslinking agents and are consumed during the curing step in the formation of covalent crosslinking agents, column 42, lines 39-43. Note that Hansen et al. do not state that *combinations* of polyols, polycarboxylic acids and polyamines can be used for crosslinking rather, that these materials, independently, can function as crosslinking agents nor the species. Accordingly in the limited case in which the crosslinking agent is also a binder, steps should be taken to prevent the binder from being consumed as a crosslinker in the step thus maintaining its binding ability. (Here again Hansen et al. do not state curing the crosslinking agent in the presence of a polyol). Hansen et al. state that the fibers should contain at least 20 % by weight water to inhibit ester bond formation during curing so that adequate *binder* will remain in the fibers to bind the particles to the fibers, column 42, lines 50- 63. Stated in another way, crosslinking with the binder destroys the binder and makes it unavailable to bind the particles, the very object of the Hansen et al. reference and therefore the skilled artisan would not look to the Hansen et al. reference for crosslinking which makes his invention inoperative. Applicants submit that even in these situations where the binder may act as a crosslinking agent, Hansen et al. do not teach the combination of a crosslinking agent and a polyol in the intrafiber crosslinking reaction to arrive at the instant invention of Claim 1. Neither do Hansen et al. disclose which polyol is in combination with which polycarboxylic acid. Furthermore, Hansen et al. is only an invitation to virtual endless experimentation. Hansen et al. give no guidance to the skilled artisan as to which binders or combination of binders from the group to select to achieve the instant invention. While Hansen et al. state that polyols, polyaldehydes, polycarboxylic acids and polyamines *can* crosslink, there is no guidance given as to which genus or species within the genus, in combination, can crosslink to arrive at the instant invention. Thus

the skilled artisan would be required to perform virtually endless experimentation to arrive at the instant invention.

Hansen et al. state that binding is performed under conditions that favor formation of hydrogen bonds or coordinate covalent bonds and *discourage formation of covalent bonds,* column 22, line 44 - 46. These hydrogen and coordinate covalent bonds can form below 145°C to room temperature, and can bind particles to fibers under neutral to alkaline conditions, column 22, line 64-65. In contrast, conditions that favor covalent bond formation require elevated temperatures above 145°C and acidic conditions, column 22, line 59 - 61.

Hansen et al. state that fibers with high bulk from intrafiber covalent crosslinks are prepared by individualizing the fibers and curing them at an elevated temperature (above 150°C) but this temperature is open ended. Can they be prepared at, for example, 300°C or at 400°C? While Hansen et al. indicate that specific binders that can crosslink are polyols, polycarboxylic acids, and polyamines (column 23, line 1- 10) the Examiner implies this to mean that any combination of a polyol and a polycarboxylic acid can crosslink and give the desired Whiteness Index fiber properties. Obviously this is not the case. Furthermore, in this context, there is no suggestion of using a crosslinking agent in the presence of polyol to crosslink cellulose.

In the instant invention, the fibers are cured at a specific temperature range for carrying out the claimed method, i.e. from 160°C to about 215°C and the individualized intrafiber crosslinked cellulosic fibers have a Whiteness Index greater than about 69.0.

Because the Hansen et al. reference teaches binding of particles by hydrogen bonding and coordinate covalent bonding and discourages the formation of covalent bonds in the binding process, there is no motivation, teacxching or suggestion to arrive at the instant invention. Furthermore, the reference teaches away from the instant invention by stating that binding occurs at low temperatures, that is, at less than 145°C and when crosslinking occurs, it is at temperatures greater than 150°C yet this is an open ended temperature. In contrast, the instant invention teaches crosslinking to form intrafiber bonds at curing temperatures of about 160 °C to about 215 °C to form individualized intrafiber crosslinked cellulosic fibers. Furthermore, the reference does not disclose which polyols to use in combination with which polycarboxylic acids to yield the

Whiteness Index fiber properties. Furthermore, Hansen et al. is only an invitation to virtual endless experimentation. Hansen et al. give no guidance to the skilled artisan as to which binders or combination of binders from the group to select to achieve the instant invention. While Hansen et al. state that polyols, polyaldehydes, polycarboxylic acids and polyamines *can* crosslink, there is no guidance given as to which genus or species within the genus, in combination, can crosslink to arrive at the instant invention. Thus the skilled artisan would be required to perform virtually endless experimentation to arrive at the instant invention. Also, the Hansen et al. reference does not show a Whiteness Index greater than about 69. Applicants submit the results are unobvious and unexpected. Withdrawal of the rejection is respectfully requested.

The Rejection of Claims 1, and 5-11, Under 35 U.S.C. § 103 (a)

Claims 1 and 5-11 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Hansen et al. (US 5,589,256) as applied to Claims 1-4, 12 and 13 and further in view of Hansen et al., US 5,789,326, (the '326 patent) for the reasons disclosed on pages 3-5 of the Office Action mailed July 28, 2005, i.e., the '326 patent cites specific polyols not recited in the '256 patent. The Examiner states that the '326 patent recites a process for preparing intrafiber crosslinked cellulose fibers which are individualized, crosslinked dried and cured, as set forth in the '256 patent. The Applicants take this to refer to column 29, lines 36 – 42 of the '326 patent. However, the Examiner states the '326 patent sets forth that the polyols may be selected as sorbitol as set forth in instant claims 6 and 7 and the other polyols recited in the instant claims embrace sorbitol as starting materials in the instantly claimed method since all the alcohols recited in the instant claims as starting materials are polyols. The Examiner states that it would have been obvious to one skilled in the art to substitute the polyols used in the '256 patent with sorbitol in view of the art as evidenced by the '326 patent, *that use of sorbitol provides sufficient functional groups for forming a hydrogen bond or coordinate covalent bond.*

Claim 1 has been addressed above, Claims 5-11 are dependent on Claim 1.

In one aspect the Hansen et al. reference (the '326 patent) describes a wet laid web of fibers having hydrogen bonding functionality and the binder molecules having at

least one functional group capable of forming a hydrogen bond or coordinate covalent bond with particles and at least one functional group capable of forming a hydrogen bond with the fibers column 3, lines 13-23. In another aspect the patent also describes high bulk fibers with hydrogen bonding functionality and similar binder characteristics.

Applicants submit that just because sorbitol can form hydrogen or coordinate covalent bonds it is not obvious, in view of these properties, that there is a motivation to apply a crosslinking agent in the presence of a polyol to a mat of cellulose fibers, cure the fibers and arrive at the instant invention in which Whiteness Index values are increased. Hansen recognizes that sorbitol can form a hydrogen or coordinate covalent bond. This however, has nothing to do with the fact that it would be obvious to combine citric acid (a polycarboxylic acid) which , as shown in the Stoyanov declaration has an adverse effect on the Whiteness Index with sorbitol (a polyol) which does not crosslink or show an increase in the Whiteness Index, to arrive at the instant invention.

Furthermore, Hansen et al. is only an invitation to virtual endless experimentation. Hansen et al. give no guidance to the skilled artisan as to which binders or combination of binders to select to achieve the instant invention. While Hansen et al. in the '256 application states that polyols, polyaldehydes, polycarboxylic acids *can* function as crosslinking agents there is no guidance given as to which genus or species within the genus, in combination, can crosslink to arrive at the instant invention. Thus the skilled artisan would be required to perform virtually endless experimentation to arrive at the instant invention. For example, assume there are 30 different compounds which include polyols and polycarboxylic acids, then 435 experiments would have to be conducted to determine which compounds crosslinked and further which combination of compounds would function to arrive at the claimed invention. This is based on the formula $n! / (k!*(n-k)!)$ where n is the number of compounds, and k is the number in each combination, i.e. 2. Thus substituting the numbers the formula is $30! / (2!*(30-2)!)$ or 435 experiments would have to be conducted to determine which compounds crosslink and which compounds, in combinations of two, would give the instant invention. Accordingly, there is no motivation to look to the Hansen et al. references for the claimed invention.

As discussed earlier and shown conclusively in the Stoyanov Declaration, polyols such as sorbitol and xylitol do not crosslink with cellulose fibers when tested under conditions in the instant invention but more importantly, they do not improve the fiber Whiteness Index. On the other hand, citric acid crosslinks as shown in the Stoyanov declaration by an increase in bulk but has an adverse effect on fiber Whiteness Index. In view of this fact, one of ordinary skill in the art would not be motivated to combine the two references to arrive at the instant invention.

Applicants submit that there is no motivation, teaching or suggestion to combine the '256 and '326 patents to arrive at the claimed invention. Both the '256 patent and the '326 patent teach away from covalent ester bonding. Bonding occurs in the two Hansen et al. patents by coordinate covalent bonding or hydrogen bonding as opposed to intrafiber crosslinking by ester bonds in the instant invention. When the Hansen et al. patents disclose crosslinking to form intra fiber bonds, they only teach the use of a binder *by itself* which can either act as a binder or a crosslinking agent (such as citric acid) rather than crosslinking with a crosslinking agent in the presence of a binder. Applicants submit that the Hansen et al. patent is only an invitation to endless experimentation and new unexpected results are realized in the instant invention. Withdrawal of the rejection is respectfully requested.

CONCLUSION

Based on the foregoing, Applicants submit that the application is in condition for allowance and request that it proceed accordingly. If the Examiner has any further questions or comments the Examiner is invited to contact the Applicants' agent.

Respectfully submitted

/ g/ Unrau

David G. Unrau
Registration No. 53, 710
Direct Dial 253-924-2439